# FIXTURE INTEGRATED DAYLIGHT DIMMING PHOTOSENSOR

FD-301



## **PRODUCT OVERVIEW**

The FD-301 is a fixture-integrated dimming photosensor. It provides a continuous dimming signal to a 0-10 VDC dimming ballast, based on daylight levels. The FD-301 is a "closed loop" system; it considers both daylight and electric light when determining dimming levels. It uses a sliding setpoint control algorithm to maintain the desired illuminance levels for separate night and day target setpoints. The FD-301 slowly raises or lowers the electric lights to avoid sudden changes that can annoy occupants. After the photosensor-equipped fixture is installed, final setup adjustments are made using the LSR-301-S remote control setup tool. After commissioning, the FD-301 automatically adjusts the electric lights to meet target illuminance levels. The FD-301 is a low voltage device used in conjunction with a Wattstopper FS-PP power pack.



## **L**legrand

#### MODELS

#### FD-301

### **SPECIFICATIONS & FEATURES**

Operating voltage: 24 VDC

Power consumption: 9mA @ 24VD

Max sink current: 50 mA

Dimensions: 1.57" x 0.98" x 0.84" (40mm x 25mm x 21.4mm) L x W x D

Weight: 64.4 grams (2.27 ounces)

Operating temperature: 32 to 104°F (0 to 40°C)

Operating humidity: 5-95%, non-condensing

Full range dimming: 0.2 VDC (min.) to 10 VDC (100% lighting) output voltage

Includes 6' (1.83m) lead with RJ45 connector and 1' (0.3m) bare leads for  $\,$  0-10 VDC signal

RJ-45 wire length: 6' (1.83m)

Maximum ballast control: 50

Sliding setpoint control algorithm

Photopic curve accurately measures light as perceived by human eye

Precise control of lighting to maintain desired light level

Optional occupant remote for increased user satisfaction and maximum energy saving

UL and cUL listed

Indoor use only

Five year warranty

#### MATERIALS

ABS, flame retardant

Meets materials restrictions of RoHS

#### FACTORY DEFAULTS

Requires configuration using LSR-301S

## **DETECTION FEATURES**



#### **Spatial Response**

The spatial response describes the sensitivity of the photosensor to incident radiation from different directions. By having a 70 degree field of view, the optical signal sensed by the FD-301 is very representative of the overall work plane illuminance, and it is less affected by normal activity in the room, such as occupant interference or temporary changes to room reflectances.

#### **Spectral Response**

The FD-301 features an advanced photocell component. For the first time in a photosensor, the photocell's response matches the human perception of light. It measures energy only in the visual range, instead of measuring energy over a wider range than the visual spectrum as do most photocells. Most photocells measure infrared and ultraviolet energy as well, and over-report daylight because it contains large amounts of these types of energy. In research conducted by the Lighting Research Center (LRC), it was estimated that over-reporting daylight illumination could result in controlled light levels being 40% lower than desired. By eliminating this source of error, the FD-301 greatly improves performance.

#### **Control Algorithm**

The FD-301 uses a sliding setpoint control algorithm. This means it has separate night and day setpoints. Each setpoint represents the desired photocell signal under that condition. To determine the correct dimming level for any given photocell reading, it calculates the level based on the slope of the line between the two setpoints. The result is accurate dimming that maintains the task illumination.

Sliding setpoint does require adjustment twice, once with no daylight present, usually at night, and once with daylight present. However, the FD-301 greatly simplifies the adjustment procedure with individual adjustment buttons on the commissioning/set-up remote.

## PHOTOSENSOR PLACEMENT AND COMMISSIONING

The photosensor-equipped fixtures are commissioned under two conditions, Night and Day. Either adjustment may be completed first. The red LED under the photosensor's lens flashes continuously until the Night and Day adjustments are both completed. Then, it can begin automatic dimming.

#### **Conditions for Setup**

Set up photosensor-equipped fixtures after all furnishings are installed. Placement of furnishings affects the way light reflects from various surfaces.

- Furniture, floor and wall coverings must be installed and clean.
- All light fixtures must be installed and fully operational.
- Window coverings must be installed, clean and operable.
- Remove unnecessary objects such as tools and installation materials from the photosensor's view.
- Do not block primary sources of electric light or daylight from reaching the photosensor's view.

Window blinds: If installed in the area, adjust them to maximize daylight while not allowing direct beam sunlight to enter the controlled area. At night, adjust them so they block lighting from outdoor fixtures. Lights from other areas: If non-dimmed lights in adjoining areas contribute to the light viewed by the photosensor, these lights must be on during both Day and Night adjustments.

#### **Target Illuminance Levels**

Determine the illuminance required in the controlled space. In some applications, a footcandle target may be specified for the controlled space. If this is the case, use a light meter to take measurements before and during the commissioning process. Choose a reference location in the controlled area that is most likely to have the lowest illuminance level during daylight conditions and is located farthest from the window or skylight. If the illuminance level is too low, select another location, or measure the illuminance level on a brighter day. If no target illuminance is specified, adjustments can be based on user perception or preferences.

#### **Adjustment Procedure**

Initial adjustments to the photosensor are done using the 5-button LSR-301-S remote control. The LED on the FD-301 should light every time you press a



button on the remote. The remote's green LED also flickers for the duration of the press.

- ▲ (Up arrow) Press to increase light output.
- ▼ (Down arrow) Press to decrease light output.

Night Press to begin and end the Night adjustment process.

Auto Press to begin automatic dimming.

Day Press to begin and end the Day adjustment process.

#### **Day Adjustment**

Make this adjustment when daylight is providing illumination that is typical of the daytime conditions at the reference location in the controlled area.

- 1. Press the Day button once. The FD-301's green LED flickers.
- Press ▲ or ▼ to adjust electric lights to the appropriate light level.
- 3. If an illuminance target is specified by the lighting designer, use a light meter at the workplane to verify the footcandle value.
- 4. Once the appropriate illuminance level is reached, press and HOLD the Day button for 3 seconds. The FD-301 acknowledges setting of the Day target setpoint by lighting the green LED twice for 3 seconds each time.

#### **Night Adjustment**

Make this adjustment when there is no daylight illumination at the reference location. To complete the night commissioning during the day, the night environment must be simulated by blocking all sources of daylight.

- 1. Press the Night button once. The FD-301's's green LED flickers.
- Press ▲ or ▼ to adjust light level. If an illuminance target is specified by the lighting designer, use a light meter at the workplane to verify the footcandle value.
- Once the target level has been reached, press and HOLD the Night button for 3 seconds. The FD-301 acknowledges setting of the Night target setpoint by lighting the green LED twice for 3 seconds each time.

#### **Begin Automatic Dimming**

Using the LSR-301-P, the user can raise the target illuminance level by up to 25% of the target illuminance level set with the LSR-301-S during commissioning, or reduce target illuminance to the minimum level for the connected lamp/ballast.

Pressing the  $\blacktriangle$  (up arrow) or  $\blacktriangledown$  (down arrow) temporarily raises or lowers the target illuminance level. The FD-301 controls the lights to maintain the new target level until another button is pressed.

Pressing Auto cancels the user adjusted target illuminance level. The FD-301 returns to automatic dimming using the levels set with the LSR-301-S.

## DIMENSIONS



## INSTALLING THE FD-301 SENSOR AND FS-PP POWER PACK IN LIGHT FIXTURE

Mount the FD-301 so the fixture's lamp output (candlepower distribution) is outside the sensor's peak sensitivity area.

- 1. Install the FS-PP as directed in the installation instructions provided with the power pack.
- 2. Determine an appropriate mounting location for the FD-301 inside the light fixture. Cut a 3/4" diameter hole through the sheet metal in the bottom of the fixture.
- 3. A beauty ring and thumbscrew collar are supplied to secure the FD-301 lens through the fixture wall. Depending on the wall thickness and curvature, the installer may need to use the thumbscrew collar on the inside or outside of the fixture, or not at all. Remove the beauty ring and thumbscrew collar from the FD-301 lens pipe.
- 4. Insert the lens from the inside of the fixture, through the hole in the bottom of the fixture. If the lens extends too far outside the fixture, use the thumbscrew collar to adjust the depth. Tighten it to the outside of the fixture or tighten it against the sensor body before inserting the lens through the fixture wall. Then, put the beauty ring onto the lens pipe and tighten it securely.



## WIRING DIAGRAMS



To connect FD-301 with FS-PP power pack, plug in RJ45 from FD-301 into TO SENSOR receptacle on FS-PP. Connect purple and pink wires from FD-301 to 0-10V inputs on dimming ballast or driver.

NOTE: Per UL, the 0-10V negative dimming wire color has been changed from gray to pink.



To add occupancy-based, automated on/off control, combine the FD-301 sensor with an FS occupancy sensor. Connect wiring as shown.

## WIRING DIAGRAMS



## **SEQUENCE OF OPERATION**

The FD-301 is designed to mount to a light fixture and dim a single zone of lights.

To immediately begin automatic dimming after the Night and Day adjustments are BOTH completed, press the Auto button. Otherwise, ten minutes after the last adjustment keypress, the following will occur:

- If only the Night setpoint has been adjusted, the signal to the ballast will remain at the level to which it was adjusted. The red LED will continue to flash.
- If only the Day setpoint has been adjusted, the signal to the ballast will go to full output (10VDC). The red LED will continue to flash.
- If both Night and Day setpoints have been established, the FD-301 will begin automatic dimming.

The red LED will flash until both the Day and Night setpoints are properly adjusted. The Night setpoint must always require more electric light output than the Day setpoint. If it does not, the red LED on the FD-301 will flash to indicate an invalid setpoint.

## **ORDERING INFORMATION**

	Master Pack Details						Inner Pack Details				
Catalog #	Master	Case dimensions (inches)			Woight		Inner	Case dimensions (inches)			Moight
	Quantity	Length	Width	Height	(pounds)		Quantity	Length	Width	Height	(pounds)
FD-301	200	20.5	17.25	14	38.4		50	19.75	7.9	8.25	9.1
FSR-301-S	250	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A
FSR-301-P	250	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A
FS-PPv2	100	21.1	19.7	10.3	21.8		N/A	N/A	N/A	N/A	N/A

Catalog #		Color	Description	Voltage		
	FD-301	White	Fixture Integrated Daylight Dimming Photosensor	24 VDC		
	FSR-301-S	White	Setup Remote Control (Required)	Two AAA batteries (included)		
	FSR-301-P	White	Occupant Remote Control	Two AAA batteries (included)		
	FS-PPv2	White	Power Pack	120/277/347 VAC; 60Hz		

Information supplied above is subject to change. Harmonization code: 8538908080. Country of origin: China.

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